Space Communications and Navigation (SCaN) Overview
Astrophysics Explorers SMEX Preproposal Conference

National Aeronautics and Space Administration

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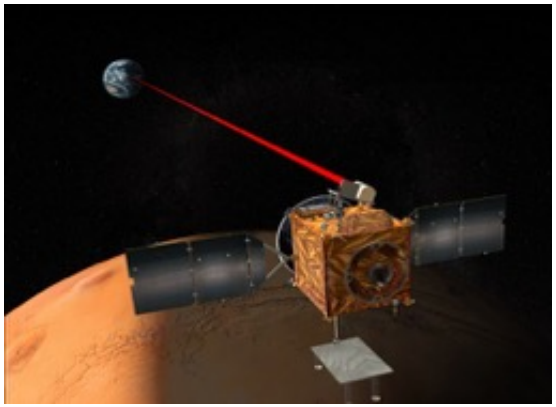
May 2, 2019

Agenda

- Space Communications and Navigation (SCaN) overview
- AO Considerations and Requirements
- Spectrum Access & Licensing
- SCaN's Mission Commitment Offices
- Points of contact

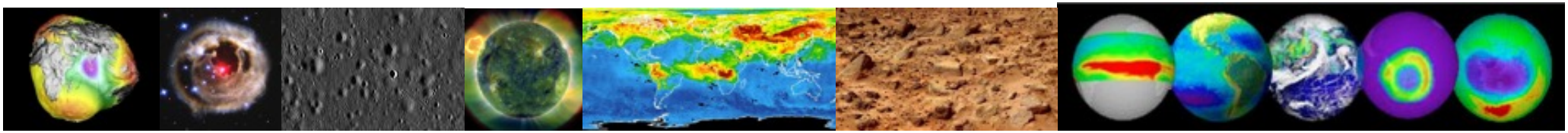
SCaN is Responsible for all NASA Space Communications



- Responsible for Agency-wide operations, management, and development of all NASA space communications capabilities and enabling technology.
- Expand SCaN capabilities to enable and enhance robotic and human exploration.
- Manage spectrum and represent NASA on national and international spectrum management programs.
- Develop space communication standards as well as Positioning, Navigation, and Timing (PNT) policy.
- Represent and negotiate on behalf of NASA on all matters related to space telecommunications in coordination with the appropriate offices and flight mission directorates.

Supporting Over 100 Missions

- SCaN supports over 100 space missions with the three networks.
  - Which includes every US government launch and early orbit flight
- **Earth Science**
  - Earth observation missions – Global observation of climate, Land, Sea state and Atmospheric conditions.
  - Aura, Aqua, Landsat, Ice Cloud and Land Elevation Satellite (ICESAT-2), Orbiting Carbon Observatory (OCO-2)
- **Heliophysics**
  - Solar observation-Understanding the Sun and its effect on Space and Earth.
  - Parker Solar Probe, Solar Dynamics Observer (SDO), Solar Terrestrial Relations Observatory (STEREO)
- **Astrophysics**
  - Studying the Universe and its origins.
  - Hubble Space Telescope, Chandra X-ray Observatory, James E. Webb Space Telescope (JWST), WFIRST
- **Planetary**
  - Exploring our solar system's content and composition
  - Voyagers-1/2, Mars Atmosphere and Volatile Evolution (MAVEN), InSight, Lunar Reconnaissance Orbiter (LRO)
- **Human Space Flight**
  - Human tended Exploration missions, Commercial Space transportation and Space Communications.
  - Exploration missions, Soyuz, Commercial crew, International Space Station (ISS) and Visiting vehicles (Soyuz, SpaceX, Boeing, Sierra Nevada)



Overview of the Three Networks

Deep Space Network

Three global ground stations providing services to missions from Geostationary Earth Orbit (GEO) to beyond our solar system.

Focused on detecting and differentiating faint signals from stellar noise

Near Earth Network

Set of world-wide NASA and commercial ground stations providing services to missions in Low Earth Orbit (LEO), High Earth Orbit (HEO) including the Moon, L1 and L2.

Space Network

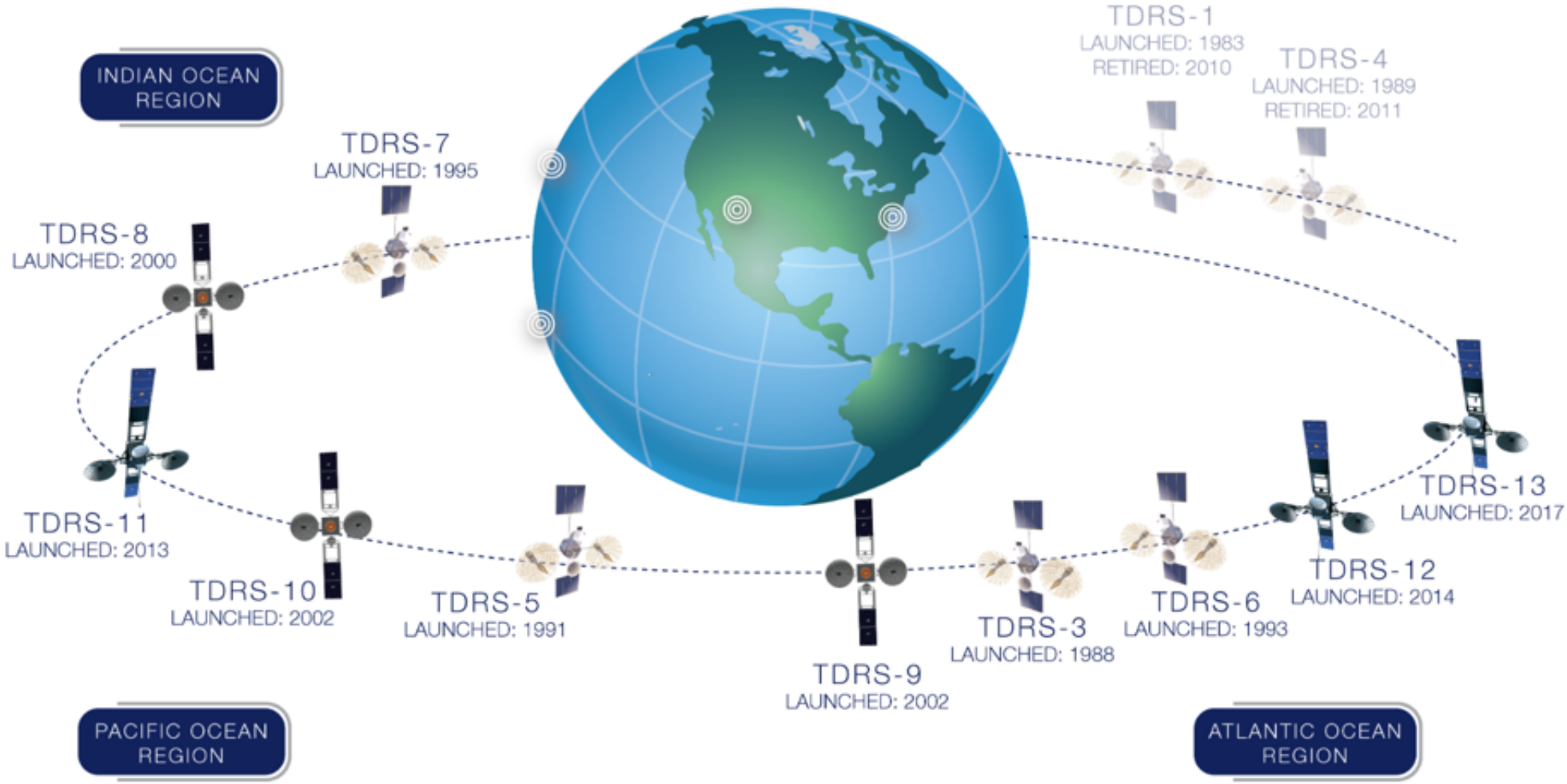
Fleet of Tracking and Data Relay Satellites (TDRS) and their ground stations providing services to missions in Low Earth Orbit (LEO)

Optimized for continuous, high data rate communications

Critical for human spaceflight safety and critical event coverage

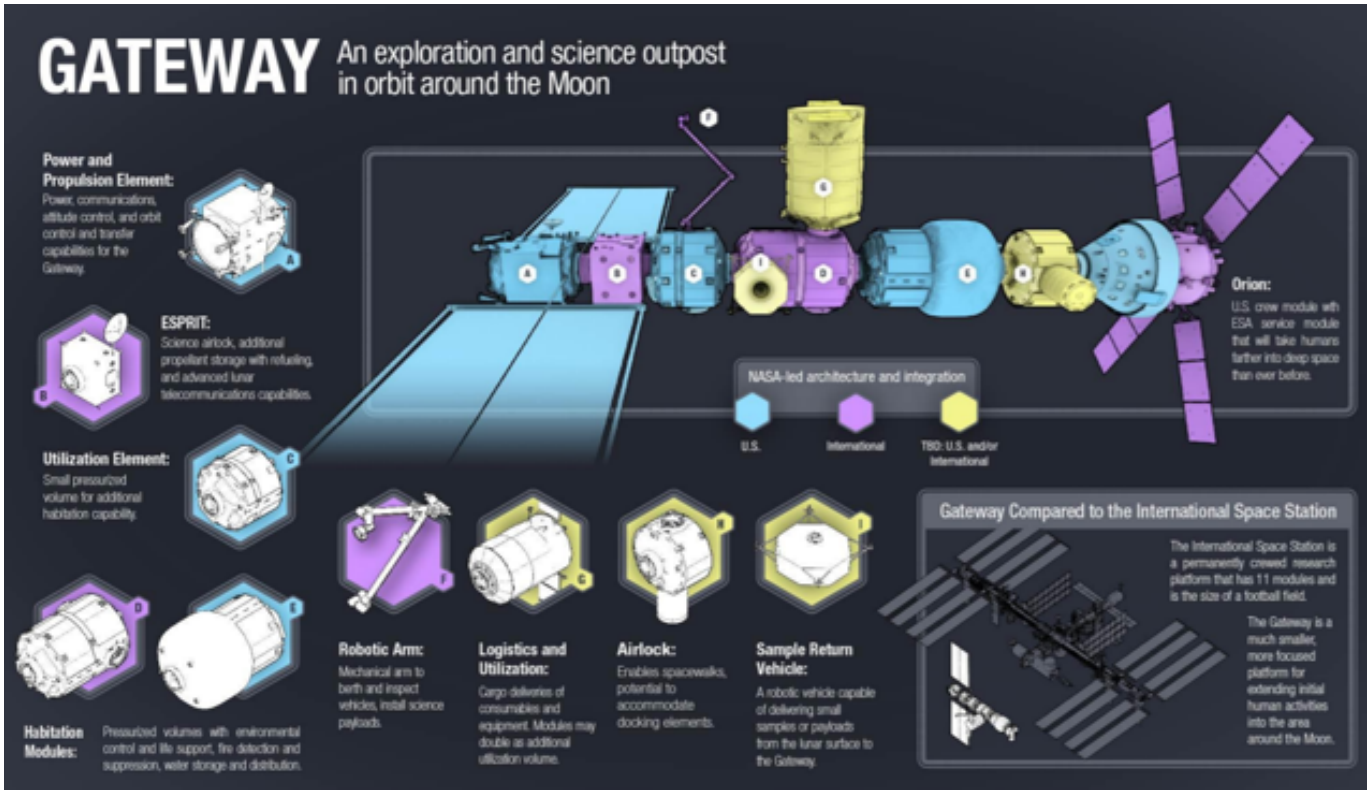
NASA Networks Span the Globe

Space Network



The Space Network consists of space segment, the Tracking and Data Relay Satellite (TDRS) and the ground stations based in White Sands, NM and Guam Island.

Gateway/Power & Propulsion Element Users Services



- First Gateway element capability targeted for launch readiness in 2022
- The Gateway will have a bi-directional s-band links, within 800km of the station, and bi-directional Ka-band links, to the Lunar Surface

Spectrum Access & Authorization

- **All NASA missions that require the use of the electromagnetic spectrum shall follow the U.S. spectrum regulatory rules/processes as referenced in NASA spectrum policy**
  - NPD 2570.5: Sets forth NASA policy and responsibilities for obtaining approval for the use of the spectrum for any NASA mission, project, or other activity
  - NPR 2570.1: NASA Spectrum Management Manual provides guidance on the use of radio frequency (RF) spectrum
  - *Spectrum Guidance for NASA Small Satellite Missions*, although targeted for smallsats, provides useful information applicable to all space missions

See: https://www.nasa.gov/directorates/heo/scan/spectrum/policy_and_guidance.html

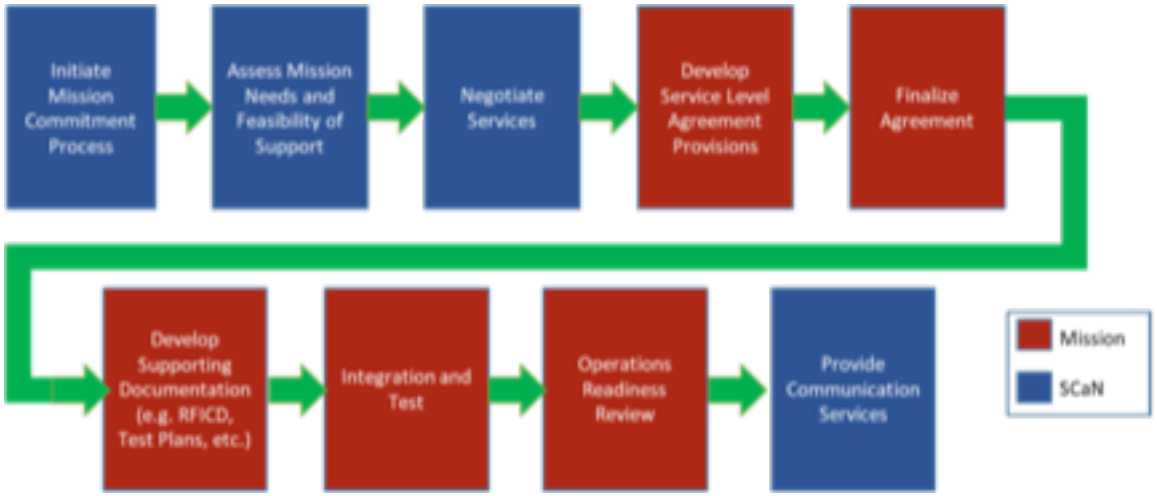
- **All missions/projects using RF spectrum must be certified/authorized**
  - NASA/Spectrum is responsible for securing spectrum certification/authorization from the federal regulator (NTIA)
  - Missions must provide the necessary information for preparing the certification and authorization submissions
- **All missions should contact their associated Center Spectrum Manager (NASA/Center-led missions) as early as possible**
  - Any project with no clear NASA Center lead may contact NASA National Spectrum Manager: John Zuzek (NASA/GRC) john.e.zuzek@nasa.gov

SCaN's Support to NASA's AO Process

- SCaN supports NASA's AO process by
  - providing documentation outlining SCaN's services, and the cost of using those services, intended to assist in the preparation of proposals, to be released with the AO (e.g. Space Communications and Navigation (SCaN) Mission Operations and Communications Services (MOCS) Document)
  - interacting with proposers as early in their development process as possible to begin pre-mission planning and analysis activities
  - assisting user missions with procuring services from other non-SCaN network entities and partners, including but not limited to other NASA organizations, other government agencies and international and commercial partners
- It is the responsibility of SCaN's Mission Commitment Office (MCO), along with the Networks Integration and Management Office (NIMO) and the Customer Interface Management Office (CIMO) to facilitate this process on behalf of the SCaN Networks.

SCaN's Mission Commitment Process

- SCaN utilizes an established process to capture and assess user requirements in order to determine how to best support those requirements.
  - The process is collaborative and relies on communication and exchange of information between the customer and SCaN throughout all phases of mission development.
- The first step in this process is for proposers to fill out the SCaN questionnaire and submit it to SCaN. This initiates the Mission Commitment Process.



- The mission commitment process consists of multiple activities that, at the highest level, include:
  - Initial requests for services via the SCaN Questionnaire
  - Dissemination of requirements
  - Feasibility assessments
  - Negotiation and development of service agreements
  - Brokering of support with partner agencies
  - Documentation support
  - Integration, verification, validation, and compatibility test activities
  - End-to-end test activities
  - Service provision

SCaN Mission Commitment Management

- SCaN provides support for missions in two ways
  - Mission Planning and Integration (MP&I)
    - Process/activities by which SCaN ensures that communications are compatible between customer and SCaN
      - Identifies communications functions and interfaces
      - Confirms successful configuration to provide service
      - Provides for anomaly support
      - Addresses root cause analysis and/or lessons learned for applicability to future missions
    - Aids in the selection of the most efficient Network(s) to support communications (of SCaN's 3 component Networks)
    - Occurs before, during, and after (as needed) mission execution
  - Network Use (DSN-, SN-, NEN-specific)
    - Real-time transport/processing of customer data through SCaN's networks
      - Forward/Return data transfer
      - Tracking and navigation
      - Science (e.g., VLBI)

SCaN Points of Contact

- SCaN Program Office/NASA HQ
  - John Hudiburg/SCaN Mission Integration & Commitments Manager
  - john.j.hudiburg@nasa.gov
  - (202) 358-1202
- GSFC/Network Integration Management Office (NIMO)
  - Jerry Mason, NIMO Chief
  - jerry.l.mason@nasa.gov
  - (301) 614-5624
- JPL/ Customer Interface Management Office (CIMO)
  - Glen Elliott / Mission Support Definitions and Commitments Office Manager
  - Glen.Elliott@jpl.nasa.gov
  - (818) 393-6373

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